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I, JULIE BILLINGSLEY, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. 2003903438 for a patent by YARRA RIDGE PTY LTD as filed on 04 July 2003.

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## Field of the Invention

This invention relates to locks for displaceable wings.

## Definitions and Conventions Employed

*This specification describes LOCK/S (as defined below) substantially as described herein with reference to and as illustrated in the accompanying drawings.*

*Throughout this specification and claims which follow, unless the context requires otherwise, the word "comprise", or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated integer or group of integers but not the exclusion of any other integer or group of integers.*

*Throughout this specification and claims which follow, unless the context requires otherwise, the positional prepositions such as rear, forward are used to assist in description of the preferred embodiments and with reference to the accompanying drawings and have in general no absolute significance.*

*Throughout this specification and claims which follow, unless the context requires otherwise, the word wing embraces both displaceable doors and windows and the word door embraces wings.*

*Throughout this specification and claims which follow, unless the context requires otherwise:* ***latching*** *means displacement of the* ***latch-bolt*** *against biasing means by an engageable means (in one form comprising a* ***strike plate)*** *and subsequent displacement of the latch-bolt into engagement with the engageable means (in one form comprising an* ***aperture*** *of the strike plate) under the action of the* ***biasing means****;* ***latch-bolt*** *is an outwardly biased bolt capable of executing latching;* ***auxiliary bolt*** *means an outwardly biased plunger that is operably associated with the latch bolt ;* ***unlatching*** *means withdrawel of the latch-bolt from engagement with the engageable means;* ***unlatching lever*** *is a lever or knob that is hand operable to cause the latch-bolt to become disengaged;* ***locking means*** *configuring the lock to restrain it from becoming unlatched;* ***deadlocking means*** *means means to configure the lock to restrain the latch-bolt from being displaced from the configuration that it assumes when engaged with the engageable means (in the case of a rectilinearly displaceable bolt it assumes a fully extended position when engaged with the engageable means);deadlatching refers to automatic deadlocking of the bolt during latching of the bolt – i.e. the bolt becomes deadlocked as a result of latching;* ***remote-lock*** *means a locking means disposed from*

*the lock that includes a remote bolt that is operably connected to the lock – often there is an upper and a lower remote-lock situated above and below the lock;* ***french door*** *means a door comprising a hollow frame with a glass in-fill where the hollow within the frame is comparatively small in depth, and* ***security doors*** *means a door comprising a hollow framed with an in-fill where the hollow within the frame is comparatively small in depth and in width - some security doors having a close weaved infil material, some having expanded aluminium mesh;* ***lock-body*** *is the lock portion fitted within the hollow frame of the wing;* ***depth of lock-body*** *is the extent of the lock body in a direction parallel to the face of the door;* ***width of lock-body*** *is the extent of the lock body in a direction at right-angles to the face of the door;* ***free-rotation-cylinder*** *(also called a free-movement-cylinder) is a cylinder comprising a key operable barrel within a* ***cylinder housing*** *connected to a* ***first cam*** *(in one form [and commonly] having a radially protruding arm) with free movement, said free-rotation-cylinder preferably comprising a* ***double cylinder*** *sub-assembly comprised of opposed barrels each connected with free movement to the same first cam such that the cam is free (between limits) to be angularly displaced while the barrels remain undisplaced.. This type of (free rotation) cylinder is commonly used in security door locks in Australia – it enable the cam to be displaced by either barrel to a locking configuration and then the barrel to be reverse rotated to an undisplaced position enabling key removal while leaving the cam in the locking position. This type of cylinder is distinct from more commonly used double cylinders that employ clutches and that do not have free rotation between the barrels and first cam.*

*This and the other provisional applications cited in the complete applications associated with this provisional describe inventions comprising improved* ***complete locks*** *for displaceable wings and* ***improvements for locks*** *for displaceable wings, for convenience referred to herein as* ***"LOCK/S"*** *– the improvements being transportable into other locks and locking devices without being limited to the complete locks described herein.*

**LOCK/S**

*(LOCK/S being defined as improved complete locks for displaceable wings and improvements for locks for displaceable wings)*

LOCK/S include the integers described below (integers including a component and a combination of components) - each LOCK/S comprising a combination of integers having a functional relationship.

LOCK/S includes the locks having common functionality [as defined in the ANSI Standards for locksets and for interconnected locks and latches] and the F designations relate to those employed by ANSI. This functionality is sumarized in the attached spreadsheet. LOCK/S in some cases include provision for connecting to and operating remote locks. This functionality is also sumarized in the attached spreadsheet.

The invention further provides LOCK/S substantially as described herein with reference to and as illustrated in the accompanying drawings.

Although some integers relate only to locks employing rectilinearly displaceable bolts (such as the drive rocker, and the return portion of the auxiliary bolt) many integers are not restricted to such bolts and can be employed in locks having pivotal bolts and in particular to locks employing deadlatching pivotal bolts.

**Forms of LOCK/S:**

LOCK/S in some embodiments have:

- the bolt comprising a latch bolt that is held in a partly extended position prior to latching,
- the strike plate being designed to deform as described in [Watts 671618]
- the latch bolt having a leading portion with curved, chamfer or otherwise profiled sides to facilitate or assist latching wherein the latch is engageable on either side by a strike plate to be inwardly displaced by the strike plate during latching whereby to be and suitable both left hand and right hand hinged doors
- the portion of the bolt that extends from the body when the bolt is fully extended has an engaging side that is engageable with the forward edge of the strike plate aperture; this engaging side is traditionally parrallel to the face of the door (except that portion that in some forms is adapted to have a reducing leading edge toa accommodate both left and right handed door) but in forms this engaging side tapers inwardly from the supported end to the free end and preferably both sides similarly taper.
- the bolt being supported in the casing between the unlatching cam and the key operable double cylinder

- dimension L (distance between cylinder and lever axis) being 85.00 mm whereby to render the lock compatatable with door furniture of common configuration
- the case lenght (vertical length when on door - excluding face plate) $l_1$= being substantially the same as that of common security door locks.
- $l_2 = l_1/2$; i.e. the bolt is in the middle of the casing (vertially when fitted)
- some or all of parts: the unlatching cam/s, cylinder, deadlocking slide, deadlocking slide extension, stop slide, wire slide, snib, snib rocker, lower slide and other components being common to locks within the series
- the bolt having an overall length substantially the same as the depth of the casing,
- the depth of the casing being relatively small being 43 +,-3 MM, and/or
- the width of the casing being 15.5 +1,-1.5 MM, and/or
- rectilinearly displaceble bolts
- integers located so that the lock employs the "industry standard" door preparation for security doors comprising a slotted aperture in the edge of the door and two apertures in each side of the door comprising vertically elongated oval shapes.

**Description of the Drawings**

Embodiments of the present invention will now be described by way of example only with reference to the accompanying drawings in which: [Fig 1 to 20 being as in the provisional application of Yarra Ridge, version 12 that is herein inclued by reference]

Figure 1 is a schematic isometric exploded view of the lock body (lock excluding strike plate, and handle sets) with the lid removed,

Figure 2 is a schematic side view of the lock body of Fig 1 with the lid and extension omitted and where the bolt is in the pre-latching configuration,

Figure 3 is a schematic side view of the lock of Fig 2, where the bolt is fully extended,

Figure 4 is a schematic side view of the lock of Fig 2, where an unlatching cam has been operated to unlatch the bolt,

Fig 5 is a schematic side view of the lock of Fig 2, in the second locked configuration,

Fig 6 is a schematic isometric view of the lock of Fig 2, in the first locked configuration,

Fig 7 is a schematic side view of the lock of Fig 2 showing the opposed protrusion abutting the extension and showing attached Bowden cables,

Fig 8 is a schematic isometric side view of the lock of Fig 2, showing attached rods,

Fig 9 to 16 are schematic side views of locks configured to provide common functionality – these figures being related to the Fig 18 and the related text

Fig 17 is a schematic isometric exploded view of the lock showing strike plate, handle sets, lid, cylinder, shafts and locking lever.

Fig 18 is a schematic isometric exploded view of the lock body showing the springs and method of assembly,

Fig 19 is a schematic side view of the assembled lock body of Fig 18

Fig 20 is a table showing components employed by lock function (lock type)

[additional to Version 11 Fig 21 is a schematic side view of the assembled lock body showing the two oval apertures of the hollow channel (extrusion) into which it is assembled, these being mirror images about a centre line through the general casing]

Fig 21 is a schematic view of an alternative bolt.

**Description of the Preferred Embodiments**

Integers include a **bolt 1** and a **casing 2,**

said casing in some forms comprising a substantially hollow **box-like member 3** having an integrally connected **face plate 4** and an attachable **side lid 6** and in some cases the face plate is a separate **face plate 7** attached to the casing by **screws** having passage through **apertures 9** while in other cases again, a **spacer 10** member is inserted between the separate face plate and casing to provide a lock of increased backset in which case the bolt and auxiliary bolt are of extened length.

said bolt preferably comprising a **first portion 11** (being a substanially prism-like solid) that is displaceable from the casing (by having passage through a **bolt aperture 12** in the face plate) and a **return portion 13** within the casing by which the bolt is supported, the upper and lower edges of the aperture are preferably substantially **semi-circular 15** in form to provide increased face plate strength and the upper and lower edges of the bolt are configured to conform to the aperture profile,

said bolt in some forms comprising an outwardly biassed latch bolt that in

some forms has a **leading end 14** portion profiled on both sides to accommodate both left hand and right hand doors wherein the leading end has curved, chamfer or otherwise profiled sides to facilitate or assist latching wherein the latch bolt is engageable on either side by a strike plate **curved wing 16** to be inwardly displaced by the strike plate during latching whereby to be and suitable both left hand and right hand hinged doors.

In some forms the bolt is deadlockable such that it cannot be displaced from the extended position by external forces.

Integers include an outwardly biased **auxiliary bolt 16** preferably comprising a **first portion 21** (being a substanially prism-like solid) that is displaceable from the casing (by having passage through a **bolt aperture 22** in the face plate) and a **return portion 23** within the casing by which it is supported, the first portion in some forms has a leading end profiled on both sides to accommodate both left hand and right hand doors wherein the **leading end 53** has curved, chamfer or otherwise profiled sides to facilitate or assist latching wherein the latch bolt is engageable on either side by a **strike plate 54 curved wing 16** to be inwardly displaced by the strike plate during latching whereby to be and suitable both left hand and right hand hinged doors.

The return portion 23 has an engageable **shoulder 17** protruding towards a **first arm 18** (of the **unlatching rocker 20** described below) to be engageable by an **engaging shoulder 19** of the first arm when the auxiliary bolt is fully extended as shown in Fig 2 – in which position the engaging shoulder is underneath the engageable shoulder while overlapping it horizontally. The engageable shoulder is displaced from above the engaging shoulder by inwards displacement of the auxiliary bolt to thereby release the unlatching rocker to enable it to be rotated (by spring) to displace the latch bolt to the fully extended and deadlatched position shown in Fig 3 (from which the latch bolt cannot be displaced by external force) . This arrangement is used to restrain the latch-bolt in a partly extended position shown in Fig 2 prior to latching to facilitate latching of a bolt that otherwise would protrude too far to be latched i.e. if fully extended it would protrude beyond the curved lip of a conventional strike plate. The auxliliary bolt is outwardly biased by **torsion spring 24.**

Integers further include a forked **unlatching rocker 20** comprising an angularly displaceable member supported at a **pivotal axis 25** defined by a **pinned extension 26** of the casing side wall 27, said pin being located towards the **rear 28** of the casing while

the **first arm 18** extends (from the pivotal axis) **upwardly 29** to terminate in a **pivotal joint 30** shared with a **coupling member 31** while the **second arm 32** extends **forward 33** and **downwardly 34** to overlap the return bolt portion 13 to be operably connected to the bolt such that the bolt is inwardly displaceable by angular displacement of the unlatching rocker. Preferably, the overlapping arm portion includes a sideways protruding **drive pin 35** that locates within a substantially vertical **drive slot 36** that in some embodiments is angled rearwardly as it progresses downwardly. In cases where an auxiliary bolt is employed, the first arm includes an engaging shoulder as described above.

Integers include means to outwardly bias the latch bolt comprising a **torsion spring 37** mounted about the drive rocker pin, said sping urging the rocker in a **anti-clockwise direction 38**. This spring also urges the rocker towards the deadlocking configuration.

Integers further includes at least one **unlatching cam 39** connected by shaft to an associated hand operable **lever 41** (in forms comprising part of a **handle assembly 42** mounted to a face of the door) and having a downwardly extending **unlatching arm 43** that has towards the free end a **driving shoulder 44.** Each unlatching cam is preferably supported by a sidways protruding **cylindrical portion 45** that extends into a **circular aperture 46** in a side of the casing and each such cylindrical portion has a **shaft 47** recess to receive and mate with a **shaft 40** connected to an operable lever of a handle assembly. In some cases an **exterior lever 48** is connected to an outer unlatching cam by an **exterior shaft 49** and an **interior lever 50** is connected to an inner unlatching cam by an **interior shaft 51** while in some cases the shaft are combined as a single shaft.

Integers further includes biasing means to urge each unlatching cam towards an undisplaced position whereby to provide biasing for each lever whereby render unnecessary lever biasing within each handle set – said biasing means preferably comprising **torsion springs 52** supported around a boss portion of one cam and having one arm fixed relative to the casing and the other engaged with a portion of a cam – preferably there is a separate spring for each cam.

Integers includes the **coupling member 31** comprising a displaceable member having at one end a **pin 55** comprising part of the pivotal joint shared with the unlatching rocker and at the other end a **driven shoulder 56** that preferably includes a sideways

extending **guide** that is supported within a **part-circular slot 57** in a side of the casing – said guide being restricted by the slot to circular motion about the unlaching cam pivotal axis, said driven shoulder being engageable by the driving shoulder of each unlatching cams such that displacement of either unlatching cam in an anticlockwise direction (with reference to the figures) causes the free end of the respective unlatching arm to displace forward to cause the driven shoulder to displace forward to cause the generally upwardly disposed first arm of the rocker to displace clockwise to displace the second unlatching rocker arm to cause the bolt to retract (displace) into the casing. Preferably the coupling member is between the unlatching arms and the driven shoulder extends towards both sides of the case to over lap each driving shoulder while being forward of each driving shoullder.

Integers include **deadlatching means** employing an adaption to the drive recess in the bolt comprising a **deadlocking portion 59** as shown in Fig 3 configured such that when the bolt is fully extended an external force on the bolt causes the bolt (either actually or virtually) to inwaredly displace till a **side wall 60** of the deadlocking portion engages with the unlatching rocker drive pin at a **point of contact**, said point of contact being defined in part by a **vector 61** that passes through the pivotal axis of the unlatching rocker or passing above it – to comprise an over-centre device where the larger the load applied to the bolt the larger becomes the force restraining the bolt against displacement.

Integers include a **stop slide 62** having a **stop blade 63** as shown in Fig 5 that is displaceable to engage in a **stop recess 64** of the outer unlatching cam (that cam connected to the exterior lever) to restain the exterior cam and hence lever, against rotation

Integers also include a lower **secondary slide 65** that is connected to the stop slide 62 by a vertically elongated **stop connecting member 66** positioned adjacent the rear casing wall and as described below, said secondary slide being operable (through snib lever or key operable cylinder operation) to lock and unlock the exterior lever by displacing the stop slide - such that when the secondary slide is displaced downwardly the engaging stop blade is displaced towards the unlatching cams. (Note: Each cam has a stop recess. At fitting of the lock, the blade is configured to be engageable in the exterior unlatching cam stop recess). In some lock functions, the secondary slide has a **drive recess 83A** having an **upper drive face 84A** on which the first cam arm engages

to drive the secondary slide upwardly to disengage the stop blade 63 and having a **lower drive face 85A** on which the cam arm engages to drive the slide from the locking configuration and in these cases the cylinder is mounted in the lock so that the first cam is displaceable rearwardly as shown in Fig 14.

additional to Version 2 Integers further includes an interior stop blade 63A engageable in a interior stop recess 64A of the inner unlatching cam, said blade 63A in some forms being part of the slide 62 so as to act correspondingly as blade 62 and in some forms being part of an inner stop slide 62A so as to be independently actuateable.

Integers include an interior hand operable member (that in one form comprises a snib or **locking lever 67**) that is connected by a **spindle 68** to an angularly displaceable **first locking cam 69** as shown in Fig 10 having an axial recess matable with the spindle and supported in the casing by a cylindrical portion that is supported within a circular aperture in a side wall, said first locking cam having a rearwardly disposed **opposed arm 70** operably connected to the secondary slide by a sideways protruding **secondary pin 71** that engages in a **horizontal slot 72** in the secondary slide, this arrangement providing operable coupling between the locking lever and secondary slide whereby to enable the stop slide to be opertated by the locking lever.

Integers further include a **deadlocking slide 73** that in some cases is cooperable with a fully extended bolt to restrain (or if the lock is a deadlatching type as described above, to assist retrain) the bolt from being displaced from the fully extended position as shown in Fig 5 – in which case a **leading end 74** of the deadlocking slide engages behind an **engageable shoulder 75** of the bolt – the configuration in which the bolt and slide cooperate is referred to as the deadlocking coinfiguration and when so engaged the deadlocking slide can be said to be in a deadlocking position (this position actually comprising a limited range of slide positions over which the bolt and slide so cooperate) .

Integers further includes an angularly displaceable **first cam 77** a radially protruding **cam arm 78** that [as described in Watts AU 706589 and subsequent divisionals patents which are included herein by reference] comprises part of a **free-rotation-cylinder 79.**

In forms, the deadlocking slide is operably connected to the locking lever by the shaft 68 that in this case is connected to an angularly displaceable **second locking**

**cam 80** supported in the casing by a cylindrical portion that is supported within a circular aperture in a side wall, said second locking cam having a sideways protruding **pin 81** that engages in a **horizontal slot 82** in the deadlocking slide (similarly as 71 and 72). In some cases the first and second locking cams are integrally connected to comprise a **toggle 82** (rocker) member having opposed arms – in which case the toggle ensures that the deadlocking slide and secondary slide move simultaneously in opposite directions..

Where the deadlocking slide is operably connected to the first cam the deadlocking slide has a **drive recess 83** having an **upper drive face 84** on which the first cam arm engages to drive the deadlocking cam towards the deadlocking configuration and having a **lower drive face 85** on which the cam arm engages to drive the deadlocking slide from the deadlocking configuration and an **exit shoulder 86** (preferably comprising an angled face) connected to the upper drive face disposed such that when in the deadlocking configuration the first cam cam be disposed such that an end face of the cam 87 (a face of constant radius) is adjacent the exit shoulder such that the force that is applied to the first cam by the deadlocking slide when an attempt is made to move the deadlocking slide from the deadlocking configuration (as might occur in an attempt to rotate the snib lever) has a direction that passes through the pivotal axis of the cam and so the cam cannot be so rotated and the first cam in this configuartion restrains the deadlocking slide.

In forms of LOCK/S there are two locking modes: **a second mode** as shown in Fig 5 characterized by the first cam arm being within the drive recess and the deadlocking slide having been displaced into the deadlocking configuration by the locking lever or by the first arm (the first arm being operably connected to a cylinder); a **first mode** as shown in Fig 6 characterized by the deadlocking slide fully displaced into the deadlocking configuration and the first cam arm displaced from within the drive recess (the first arm being operably connected to a cylinder) to restrain the deadlocking slide fully displaced in the deadlocking configuration from which the deadlocking slide cannot be displaced by the locking lever.

Preferably the deadlocking slide supports a spring loaded **ball 88** that is engageable in **recesses 89** in the side of the casing corresponding to an undisplaced slide: **recess 89a** and a deadlocked slide: **recess 89b** in the second deadlocking configuration – the location of the recesses being shown in Fig 3 although the lid in

which they exist has been omitted. There is preferably an oversized **aperture 89c** allowing passage of the ball to enable the ball and spring to be loaded after the laock has otherwise been assembled.

Preferably the first cam comprises part of a free-movement-cylinder.

[additional to Version 11 The free-rotation cylinder preferably includes at least one compression spring between the cam and a barrel (located within an axial pocket of the cam) to urge the cam against (the opposed barrel or against its associated circlip or against an edge of the housing) to cause increased friction on the cam so that if the cam is displaced through engagement with another member, such as a deadlocking slide, it will come to rest soon after the deadlocking slide ceases to act – the friction acting contrary to the rotational inertia of the cam, alternatively the cylinder may include a compressed wave washer located between the cam and the adjacent circlip that retains the adjacent barrel; in either case what is important is that the cam is subject to frictional forces that gives rise to a moment that act to accelerate (negatively) a moving cam till it comes to rest and importantly, to come to rest while the cam arm is within the drive recess so that the lock does not become locked in the first locking mode]

Integers include an **extension 90** as shown in Fig 7 to the deadlocking slide that (preferably comprises a plate like member) extending from the deadlocking slide to the upper end of the casing and that takes a number of forms depending on the functionality it is to provide. In cases where operating the interior lever must unlatch the lock after it has been locked to the second locked configuration (by the locking lever or cylinder) to render the exterior lever inoperative as shown in Fig 7, (and the first and second locking arm comprise a toggle), the extension is configured to overlay the unlatching rocker and the second arm of the unlatching rocker has an **opposed pin 91** (extending in the opposite direction to the drive pin 35) that extends to the casing side wall to overlap (vertically) a **drive edge 92** of a **slotted portion 93** of the extension, the integers being configured such that when locked by locking lever the drive edge is displaced to locate under and adjacent the opposed pin 91 of the drive rocker in the deadlatching configuration (i.e. with the drive pin in the deadlocking portion of the drive slot) and where operation of the interior lever displaces the drive rocker to displace the opposed pin to displace the extension to displace the deadlocking slide to displace the toggle to displace the secondary slide to displace the stop connecting member to displace the stop member to displace the stop slide from the stop recess in the exterior unlatching cam while simultaneously unlatching the latch bolt as shown in Fig 7. By the above

means a lock locked by snib or by cylinder into the second locked configuration can be unlatched and unlocked by simply operating the interior unlatching lever – all in a simple downward hand operation. [And where there are remote locks controlled by the deadlocking slide displacement, the same action also causes all remote bolts to fully retract]. The extension is preferably connected to the deadlocking slide by a **pinned extension 94** of the slide that mates within an **aperture 95** of the extension and where the extension is to operate an **upper rod 98** as shown in Fig 8, the upper end of the extenstion is connected to a **rod joiner 96** by a **pinned extension 97** of the joiner.

In other cases where the extension is required to unlatch the bolt as shown in Fig 12, the extension comprising a **modified extension 90A** includes a **drive edge 98** that is engageable with a **sideways protrusion 99** of the drive shoulder 56; the components being configured such that when the latch bolt is fully extended and the first cam 78 is within the drive recess 83 of the undisplaced deadlocking slide, the edge 98 abutts the protrusion 99 so that operation of the key to upwardly displace the deadlocking slide causes the drive edge to displace the ptotrusio upwardly to retract the latch bolt.

Integers include a secondary slide having a **recess** to receive and mate with a **lower return shoulder** of the lower end of the stop connecting member so as to operably connect to the stop slide. The stop connecting member in the vicinity of the unlatching cams has amother **upper return shoulder** connected to the stop slide - this being configured such that when the lock is locked to the first or second locked configuration by the snib or by the cylinder the blade of the stop slide is displaced into the stop recess of one or the other unlatching cam. The stop slide is supported between side walls of an extension to the casing and retained within the casing by the stop connecting member which in the vicinity of the stop slide can be displaced reafwardly to release the stop slide enabling it to be withdrawn, inverted and replaced to be engageable in the stop recess of the other unlatching cam. This is necessary to accommodate left and right hand doors where one unlatching cam is the exterior unlatching of a left hand door and the other is the exterior unlatching cam of a right hand door and where in each case it is the exterior unlatching cam one wishes to restrain.

In cases where operating the interior lever must unlatch the lock after it has been locked to the second locked configuration (by the locking lever or cylinder) to render the exterior lever inoperative (and the first and second locking arm comprise a toggle), the deadlocking slide is further configured such that as the interior lever is rotated the initial

displacement of the unlatching rocker causes opposed pin to displace to displace the deadlocking slide so as no longer restrains (or help restrain) the bolt. Further displacement causes the bolt to commence inwards displacement while causing the deadlocking member to downwardly displace away from the bolt – the deadlocking slide while preferably engaging behind a portion of the bolt in the deadlocking configuration (and preferably with a little free movement between the bolt and the deadlocking slide), always allow the bolt free displacement as it is inwardly displaced by the unlatching rocker - this requirement impacting heavily on the shape of the latch bolt, drive edge, deadlocking slide and rocker.

Integers include a secondary slide 65 having a substantially cylindrical **lower rod recess 100** that is preferably defined by a longitudinal axis in a plane parallel the face of the door and a rod **top joiner 96** having an **upper rod recess 101** defined by a longitudinal axis in a plane at right angles to the face of the door – the rod top joiner being connected to the extension to be displaceable by deadlocking slide displacement. Each of these rod recesses and the material adjacent the recesses is configured to enable the recess to accept the right angled return portion of a rod that connects to lower and upper remote lock respectively.

Integers further include a secondary slide having a slotted **lower wire recess 102** defined by a longitudinal axis in a plane parallel the face of the door and a stop slide having an **upper wire recess 102** defined by a longitudinal axis in a plane at right angles to the face of the door. Each of these wire recesses and the material adjacent the recesses is configured to enable the recess to accept the right angled **return portion 104** of an **inner 106 Bowden Cable 105** that connects to lower and upper remote lock respectively. In these cases the casing preferably includes **slotted recesses 103** to receive and mate with **end portions 106** of the outer Bowden cable so as to retain the end of the outer portions fixed in relation to the casing – these end portion having sideways protruding **fingers 107** that locate in the slotted apertures 103

Integers further include a stop slide designed to connect to cable but without a stop blade and this case comprising a **cable stop joiner 62A.**

**Forms of Integers**

Integers further include the integers described above further configured such that

- A) the latch bolt has a leading portion with curved, chamfer or otherwise profiled sides to facilitate or assist latching wherein the latch is engageable on either side by a strike plate to be inwardly displaced by the strike plate during latching whereby to be and suitable both left hand and right hand hinged doors
- B) the strike plate is designed to deform as described in [Watts 671618] and such a strike plate in included herein by reference.
- C) the bolt is supported in the casing between the unlatching cam and the key operable double cylinder as shown
- D) dimension L (distance between cylinder and lever axis) is 85.00 mm whereby to render the lock compatatable with door furniture of common configuration
- E) the case lenght (vertical length when on door - excluding face plate) $l_1$ is substantially the same as that of common security door locks being 150 MM
- F) $l_2 = l_1/2$=75 MM; i.e. the bolt is in the middle vertically of the casing (when fitted)
- G) some or all of the integers including the unlatching cam/s, cylinder, deadlocking slide, deadlocking slide extension, stop slide, wire slide, snib, snib rocker, lower slide and other components are common to locks within the series
- H) the bolt has an overall length substantially the same as the depth of the casing
- I) the depth of the casing is relatively small being 40 + or -3 MM
- J) the width of the casing is15.5 +1,-1.5 MM
- K) the bolt is rectilinearly displaceable
- L) the toggle has pins and arms of increased strength and there is additional material surrounding the spindle aperture to restain the cylinder portion from splitting whereby to enable the toggle to apply larger forces to the extension and secondary slide whereby to deliver greater driving forces to rods attached to remote locking means that in soime cases provide plunger like members. And

[additional to Version 11 M) The integers are located so that the lock employs the "industry standard" door preparation for security doors comprising a slotted aperture in the edge of the door and two apertures in each side of the door comprising vertically elongated oval shapes defined by the dimensions 39, 39, R10 and 25.7 of Fig 21]

[additional to Version 1] These configurations impose some difficult boundary conditions on the LOCK/S that observe the conditions because:

a) a consequence of M) is that the all members passing between the lock and handle sets must pass through one of two oval apertures – these being the rod/s connecting lever/s to cam/s within the casing, the euro-style cylinder, the snib spindle, and the fixing bosses that extend from the underside of an upper portion and from a lower portion of the handle plate/s through which fixing screws have passage and by which the handle sets are mounted to the door. These bosses preferable extend into the lock casing to help support the lock body and/or to provide adequate threaded engagement for the screws, and

b) D) the requirement that dimension L (distance between cylinder And lever axis) is 85.00 mm further qualifies a) above because the cylinder and lever axis must also fall within an oval side aperture in the door.

c) the above restrictions are extended by E) which requires the casing to have a length of 115 MM and by I) which defines the depth of the casing.

d) Because a bolt (by convention and trial) needs to extend at least ½" to perform its normal function and because it is preferable for security door locks to extend even futher and because it is desireable for the fully extended bolt to be supported by a portion of length not too disimilar from the extended length H) is proposed, this restriction placing requirments on the integers responsible for bolt displacement and restrictions on integers competing for space adjacent the bolt; and when these restrictions are combined with d) above a consequence arrises that a fully retracted bolt extends inwardly to a depth not not too disimilar to the depth of the casing placing restrictions on the length and width of the bolt and restrictions on integers competing for space adjacent the bolt.

e) similarly, J) defines a limit imposed by the requirement for the lock body to fit within an extrusion of 16.00 MM nominal width; this restriction on casing width of 15.5 MM (a comparatively small width for a door lock) placing restrictions on the width of the bolt and restrictions on integers competing for space adjacent the bolt.

Some embodiments of the invention observe all of the restrictions A) to M) - these being described below and being shown in the Figures 1 to of 20 LOCK/S]

LOCK/S further include a substantially conventional strike plate that is modified as shown in Fig 17, said strike plate comprising an aperture 130 engageable with the

extended bolt and including a front aperture edge 131 against which the bolt pushes if one attempts to opne a locked door. The aperture is within a substantially flat plate-like portion 132 extending from between a lower slot 133 to an upper slot 133 and connected to a blade 134 that preferably comprises an angled or curved blade. The blade is connected by bridges 135 of reduced cross-sectional area 156 and the strike is of a deformable material enabling these bridges to deform without cracking and the reduced area enables deformation to occur at reduced forces – these characteristics enabling the blade to be angularly displaced about an axis 157 that passes substantially through each bridge.

The bridges connect to fixable portions 158 that include apertures 159 through which screws shanks have passage and by which the fixable portion is attached to a door jamb. In some types of deformation the fixable portions angularly displace about the screw – this displacement being afforded by the reduced strength of the bridge portion that deforms to accommodate such displacement.

The blade of this design supports the front edge and the blade is only attached at each end (by fixable portions) to the door jamb thereby being deformable like a bow and at moderate forces.

The upper and lower extremes of the plate-like portion 132 (that portion between the aperture 130 and the slot 133), portions 140 are of reduced cross-sectional area to enable these portions to deform under low forces so as to deform as the blade portion angularly displaces – these portions engaging the face of the lock as the bridge portions deform to enable the blade to displace.

When a closed and locked door is urged open under the action of a jemmy placed adjacent the bolt, the bolt is forced against the front edge while the lock is simultaneously displaced away from the strike plate and in this case the bolt drags the front edge (while deforming the blade) with it to remain engaged – and in this case the bridges may deform and move closer together (through rotation) to enable the blade to further deform to enable the front edge to further displace.

If the jemmy rests on the strike plate as it is rotated then then this action causes the blade to angularly displace to deform the bridges. Typical deformation is as shown in Fig 21

When a closed and locked door is urged open under the action of a jemmy placed adjacent the bolt, the bolt is forced against the front edge while the lock is simultaneously displaced away from the strike plate in general and in this case the bolt

drags the front edge (while deforming the blade) with it to remain engaged with it – and in this case the bridges may further deform and effectively move closer together (through rotation) to enable the blade to further deform to enable the front edge to further displace.

[additional to Version 11 By this action the bolt is able to cause the strike plate front edge to displace with it whereby to maintain engagement between the bolt and strike plate while the screws attaching the strike plate to the door jamb are subjected to lower forces and are less likely to pull out than they would in a conventional strike plate]

The portion of the bolt that extends from the body when the bolt is fully extended has an engaging side that is engageable with the forward edge of the strike plate aperture; this engaging side is traditionally parrallel to the face of the door (except that portion that in some forms is adapted to have a reducing leading edge to accommodate both left and right handed door) but in forms this engaging side tapers inwardly from the supported end to the free end and preferably both sides similarly taper. This taper is to faciliate latching where the door has been prevented from fully closing as happens often when a strip of compressible sealing material is located between the door and the edge that it closes against – this strip being to prevent energy loss. In this case the latched bolt remains partly extended till the door is further displaced in a closing direction by other means such as forcing the door and/or employing remote locks.

LOCK/S further includes a method of manufacture to enables the lock to be assembled in-part (and substantially completely) by pick and place machines – the requirements of this method impacting strongly on the individual component design. The method includes:

**A Place parts into the casing by simple vertical movement and one at a time:**

- placing the lower unlatching cam into the casing
- placing coupler into the casing and over the lower unlatching arm
- placing the latch bolt into the casing
- placing the rocker into the casing and over the coupler and bolt
- placing the upper unlatching cam into the casing and adjacent the first
- placing the toggle uinto the casing

- placing the secondary slide into the casing and over a pin of the toggle
- placing the deadlocking slide into the casing and over a pin of the toggle
- placing the stop slide into the casing
- placing the stop connecting member into the casing

**B By hand or other means**

- load the auxiliary bolt spring under tension
- load the rocker spring under tension

**C Place parts into the casing by simple vertical movement and one at a time:**

- placing the spring for the upper unlatching cam into the casing and over the cylindrical portion of the upper unlatching cam so a protruding end 110 engage with the shoulder 111
- placing the spring for the lower unlatching cam and into the casing and over the cylindrical portion of the upper unlatching cam so a protruding end 112 engage with the pin 113
- placing the spring 114 into the deadlocking slide
- placing the extension into the casing
- placing the lid onto the casing

**D Attach the lid** by screws through apertures 115, or alternatively where screws are replaced by protruding pins (as per 116) place the loaded casing into a press and flatten the rivets.

**E After the lid is attached**

- load the ball 117 (through the enlarged aperture 118 in the lid) into the deadlocking slide and while holding the ball in place displace the deadlocking slide so the ball is no longer adjacent to the enlarged aperture.
- place a shaft through the apertures in the unlatching cams and rotate the cams to tension the springs 52
- insert stop member (an annular hollow rivet) 119 that acts to restrain the (now spring biased) unlatching cams from displacing in an unlatching direction past a

pre-determined undisplaced position as shown in Fig 19 – and where the shoulders 120 are abutting the stop member.

**Complete locks (complying with common functionality requirements) and comprising a combination of the integers described above**

**Fig 9, Passage Lock, F75** latch bolt operated by lever from either side at all times.

**Fig 10, Privacy, F76 G2 and 3** deadlocking latch bolt operated by lever from either side except when levers are locked by locking lever on inside. Unlocking by locking lever and by an exterior locking lever comprising a coin slot. From this lock we can derive another function by omitting the exterior coin slot. Both this latter function and F76 can be modified to operate remote locks – in which case the secondary slide includes a recess to accept a return shoulder of a wire as shown in Fig 3 or a rod as shown in Fig 8 and the stop slide is similarly adapted as shown in Fig 2.

**Fig 11, Patio, F77 G2 and 3** deadlocking latch bolt operated by lever from either side except when outside lever is locked by locking lever on inside. Automatic unlocking when inside lever is rotated or unlocked by locking lever. F76 can be modified to operate remote locks – in which case the secondary slide includes a recess to accept a return shoulder of a wire as shown in Fig 3 or a rod as shown in Fig 8 and the stop slide is similarly adapted. Alternatively the lock may include a top rod joiner connected to the extension, said joiner including a recess as shown in Fig 6 to accept a upper rod return portion as shown in Fig 8.

**Fig 12, Entrance, F 81** deadlocking latch bolt operated by lever from either side except when outside lever is locked by locking lever on inside. When outside lever is locked, latch bolt retracted by key in exterior cylinder or rotating interior lever. Locking lever must be operated to unlock exterior lever. F 81 can be modified to operate remote locks – in which case the secondary slide includes a recess to accept a return shoulder of a wire as shown in Fig 3 or a rod as shown in Fig 8 and the stop slide is similarly adapted as shown in Fig 2.

**Fig 13, Entrance, F82 G 1** deadlocking latch bolt operated by lever from either side except when outside lever is locked by locking lever on inside. When outside lever is locked, operating key in exterior cylinder or rotating interior lever unlocks the exterior lever. F82 can be modified to operate remote locks – in which case the secondary slide

includes a recess to accept a return shoulder of a wire as shown in Fig 3 or a rod as shown in Fig 8 and the stop slide is similarly adapted. Alternatively the lock may include a top rod joiner connected to the extension, said joiner including a recess as shown in Fig 6 to accept a upper rod return portion as shown in Fig 8.

**Fig 14, Classroom, F84** deadlocking latch bolt operated by lever from either side except when outside lever is locked by key from exterior. When outside lever is locked, latch bolt retracted by rotating interior lever or by unlocking exterior lever by key and then operating exterior lever. F84 can be modified to operate remote locks – in which case the secondary slide includes a recess to accept a return shoulder of a wire as shown in Fig 3 or a rod as shown in Fig 8 and the stop slide is similarly adapted as shown in Fig 2.

**Fig 15, Store, F86** outside knob is fixed and bolt retracted by key or operating interior lever

**Fig 16, Store, F91** deadlocking latch bolt operated by lever from either side except when both levers are locked by key from either side.

**Other complete locks comprising a combination of the integers described above**

**Fig 7, Security or French Door, AL100** with provision to connect to upper and lower remote locks by a vertically displaceable members ("control member") that displace simultaneously in the same direction, in some cases comprising rods but preferably comprising inner Bowden cables where the outer cable portion is preferably attached to the casing. The upper control member attaches to a recess in the stop slide while the lower drive member attaches to a recess in the secondary slide which is actuated by the deadlocking slide that in turn is actuated by locking lever or the key operable cylinder.

Where these lock include the extension 90 and the lock is in the second locked mode, operation of the interior lever a) unlatches the bolt while b) displacing the control members to retract the bolts of remote locks while c) unlocking the exterior lever. If the lock is in the first locked mode it must be unlocked by key (interiorily or exteriorily) before either lever can be operated to unlatch the bolt. Where the extension 90 is omitted and the lock is in the first locked modes it must be unlocked by key but if it is in the second locked modes it it can be unlocked by either key or locking lever.

Where the stop slide comprises a stop joiner, independent locking of the exterior lever is not possible and the lock is locked as a result of the deadlocking slide engaging with the bolt and in these cases the extension is omitted.

**Fig 8, Security or French Door, AL200** with provision to connect to upper and lower remote locks by a vertically displaceable members ("control member") that displace simultaneously in the same direction, in some cases comprising cables but preferably comprising rods. The upper control member attaches to a recess in the top rod joiner while the lower control member attaches to a recess in the secondary slide which is actuated by the deadlocking slide that in turn is actuated by locking lever or the key operable cylinder and because the extension and secondary slide move simultaneously in opposite diecrtions, so does the secondary slide and top joiner.

Where these lock include the extension 90 and the lock is in the second locked mode, operation of the interior lever a) unlatches the bolt while b) displacing the control members to retract the bolts of remote locks while c) unlocking the exterior lever. If the lock is in the first locked mode it must be unlocked by key (interiorily or exteriorily) before either lever can be operated to unlatch the bolt. Where the extension 90 is omitted and the lock is in the first locked modes it must be unlocked by key but if it is in the second locked modes it it can be unlocked by either key or locking lever.

Where the stop slide comprises a stop joiner, independent locking of the exterior lever is not possible and the lock is locked as a result of the deadlocking slide engaging with the bolt and in these cases the extension is omitted.

**Description of lock problems/deficiencies addressed by the inventions**

Commonly used locks employed in french doors are locked by key to simultaneously restrain both interior and exterior unlatching levers from being operated to unlatch the lock – the cylinder must then be operated from interior or exterior to enable unlatching. It would be more convenient to have an interior locking lever by which to configure the lock to prevent the exterior lever from unlatching the lock while enabling the interior lever to be operated to unlatch the lock to permit exit. This functionality is also particularly applicable to security doors having close weaved infil material.

Where the lock is connected to remote locks, it would more convenient and safer (fire consideration reasons) to have operation of the interior unlatching lever to operate the remote locks to cause the remote bolts to retract. This functionality is applicable to french doors and is also applicable to security doors having close weaved infil material.

Locks commonly used in hollow-framed doors (particularly french doors) employ a double profile cylinder having a clutch and require the key to be rotated 360 degrees for locking and unlocking – this being difficult because of the proximity of the key to the edge of the door. It would be more convenient to employ a free-rotation-cylinder.

To be suitable for french doors, locks must have a lock body of small depth and to be suitable for security doors, the lock must also have a small width. Additionally to be suitable for security doors, the lock must employ an "industry standard" door preparation comprising a slotted aperture in the edge of the door and two apertures in each side of the door comprising vertically elongated oval shapes.These requirements define a small lock body in which the location of components having passage through the wing (such as unlatching handle shafts, the cylinder etc) must have passage within a vertically elongated oval shape.

Locks commonly employed in security and french doors employ interior and exterior furniture comprising a handle or knob supported within a back plate and spring biassed towards an "undisplaced" configuration – (usually horizontal). For fitting, cost and manufacturing reasons, it is advantageous for each lever to be free within the backplate and obtain its biasing from the lock-body via a shaft connected to the lock-body. Although this feature is achieved in known large lock-body locks through the employment of a rectilinearly displaceable slide, it is not common in locks for hollow-framed-doors.

Locks commonly employed in french doors have both a latching bolt and a deadlocking bolt and for reasons of fitting, cost, manufacture and compatibility with other requirements it is preferable to employ a single deadlatching latch-bolt

Locks commonly employed in security doors have special configured handles and back-plates and for reasons of interchangeability, cost, manufacture and compatibility with french door lock requirements it is preferable to employ handle/backset subassemblies of common configuration where the distance between the handle axis of rotation and cylinder complies with an industry standard.

Locks commonly employed in french doors do not have an interior "locking-snib" by which to lock the latch bolt as do common security door locks.

**Claims defining the inventions**

*This specification describes LOCK/S (as defined below) substantially as described herein with reference to and as illustrated in the accompanying drawings.*

*Throughout this specification and claims which follow, unless the context requires otherwise, the word "comprise", or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated integer or group of integers but not the exclusion of any other integer or group of integers.*

*Throughout this specification and claims which follow, unless the context requires otherwise, the positional prepositions such as rear, forward are used to assist in description of the preferred embodiments and with reference to the accompanying drawings and have in general no absolute significance.*

*Throughout this specification and claims which follow, unless the context requires otherwise, the word wing embraces both displaceable doors and windows and the word door embraces wings.*

*Throughout this specification and claims which follow, unless the context requires otherwise:* ***latching*** *means displacement of the* ***latch-bolt*** *against biasing means by an engageable means (in one form comprising a* ***strike plate)*** *and subsequent displacement of the latch-bolt into engagement with the engageable means (in one form comprising an* ***aperture*** *of the strike plate) under the action of the* ***biasing means;*** ***latch-bolt*** *is an outwardly biased bolt capable of executing latching;* ***auxiliary bolt*** *means an outwardly biased plunger that is operably associated with the latch bolt ;* ***unlatching*** *means withdrawel of the latch-bolt from engagement with the engageable means;* ***unlatching lever*** *is a lever or knob that is hand operable to cause the latch-bolt to become disengaged;* ***locking means*** *configuring the lock to restrain it from becoming unlatched;* ***deadlocking means*** *means means to configure the lock to restrain the latch-bolt from being displaced from the configuration that it assumes when engaged with the engageable means (in the case of a rectilinearly displaceable bolt it assumes a fully extended position when engaged with the engageable means);deadlatching refers to automatic deadlocking of the bolt during latching of the bolt – i.e. the bolt becomes deadlocked as a result of latching;* ***remote-lock*** *means a locking means disposed from the lock that includes a remote bolt that is operably connected to the lock – often there is an upper and a lower remote-lock situated above and below the lock;* ***french door*** *means a door comprising a hollow frame with a glass in-fill where the hollow within the frame is comparatively small in depth, and* ***security doors*** *means a door comprising a*

*hollow framed with an in-fill where the hollow within the frame is comparatively small in depth and in width - some security doors having a close weaved infil material, some having expanded aluminium mesh;* ***lock-body*** *is the lock portion fitted within the hollow frame of the wing;* ***depth of lock-body*** *is the extent of the lock body in a direction parallel to the face of the door;* ***width of lock-body*** *is the extent of the lock body in a direction at right-angles to the face of the door;* ***free-rotation-cylinder*** *(also called a free-movement-cylinder) is a cylinder comprising a key operable barrel within a* ***cylinder housing*** *connected to a* ***first cam*** *(in one form [and commonly] having a radially protruding arm) with free movement, said free-rotation-cylinder preferably comprising a* ***double cylinder*** *sub-assembly comprised of opposed barrels each connected with free movement to the same first cam such that the cam is free (between limits) to be angularly displaced while the barrels remain undisplaced.. This type of (free rotation) cylinder is commonly used in security door locks in Australia – it enable the cam to be displaced by either barrel to a locking configuration and then the barrel to be reverse rotated to an undisplaced position enabling key removal while leaving the cam in the locking position. This type of cylinder is distinct from more commonly used double cylinders that employ clutches and that do not have free rotation between the barrels and first cam.*

***The free-rotation cylinder in some cases includes at least one compression spring between the cam and a barrel to cause increased friction on the cam so that if the cam is displaced through engagement with another member, such as a deadlocking slide, it will come to rest soon after the deadlocking slide ceases to act – the friction acting contrary to the rotational inertia of the cam, alternatively the cylinder may include a compressed wave washer located between the cam and the adjacent circlip that retains the adjacent barrel; in either case what is important is that the cam is subject to frictional forces that gives rise to a moment that act accelerate (negatively) a moving cam till it comes to rest and importantly, in some cases comes to rest while the cam arm is within the drive recess.***

View from above

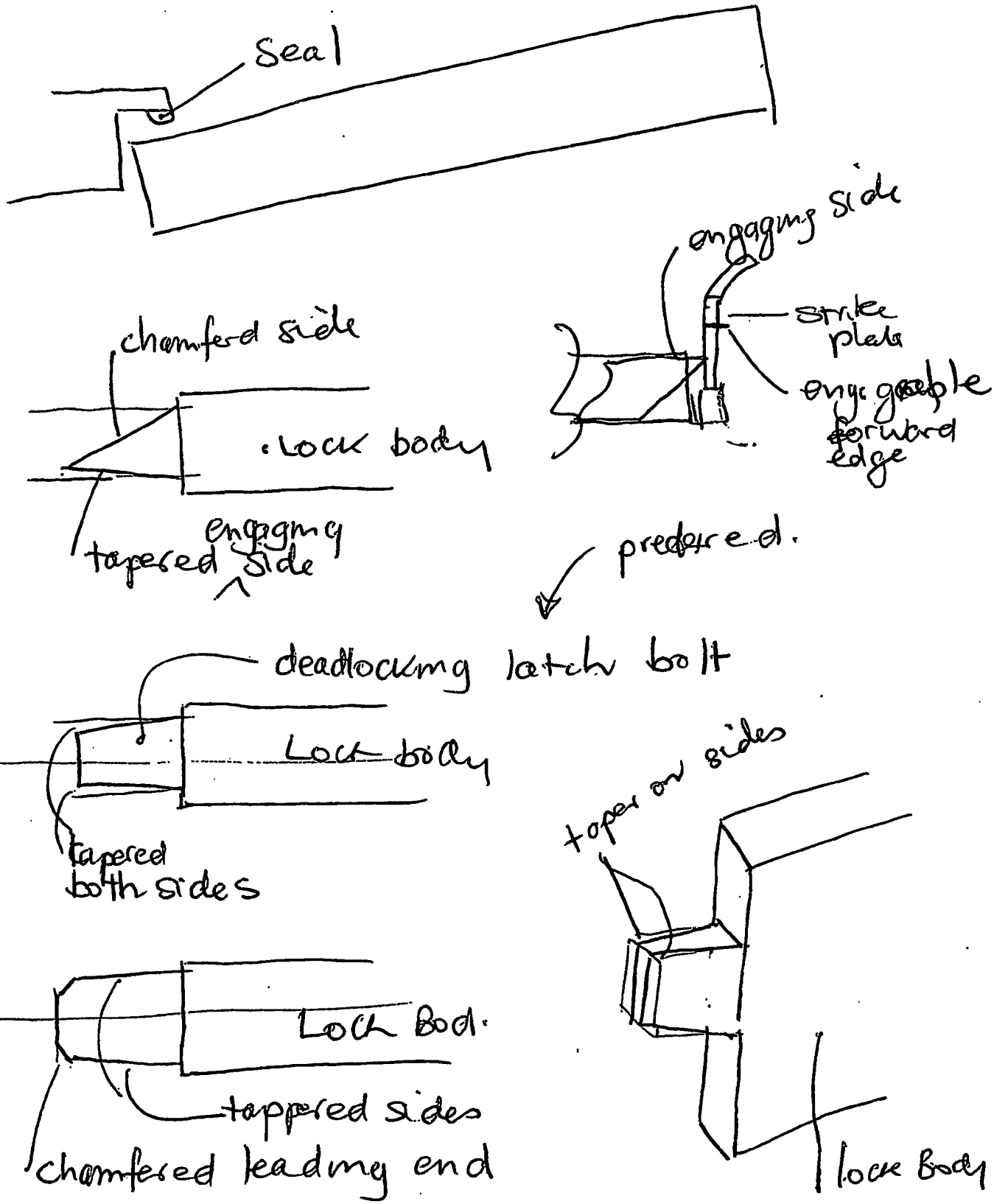


Fig 21